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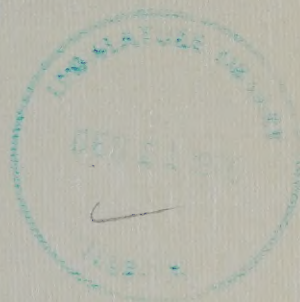
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REPORT OF THE OPERATIONS OF THE ENERGY RESOURCES CONSERVATION BOARD

1971



Alberta

ENERGY RESOURCES CONSERVATION BOARD

603 SIXTH AVENUE SOUTH WEST • CALGARY 1, ALBERTA, CANADA

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ENERGY RESOURCES CONSERVATION BOARD

603 SIXTH AVENUE SOUTH WEST • CALGARY 1, ALBERTA, CANADA

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Chart of Board Organization

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P R E F A C E

This report is the ninth edition of an annual report on the operations of the Energy Resources Conservation Board, previously called the Oil and Gas Conservation Board. It is introduced with a brief discussion of the general activities of the oil and gas, hydro and electric and coal industries in 1971. Following this is a summary of the constitution, responsibilities and functions of the Board; a discussion of its organization and staff; and a general summary of important statutory changes affecting the Board. The main section of the report deals with the responsibilities, organization and activities of the several departments of the Board and discusses the role of each in the discharge of the overall responsibilities of the Board. There is a statement of Board expenditures and revenues, comparing them with previous years and with indices of industry and Board activity. Finally, the addresses and publications of the Board and its staff for 1971 are tabulated.

FEBRUARY, 1971

I THE ALBERTA OIL AND GAS INDUSTRY IN 1971

Exploration

Exploratory effort in Alberta during 1971 did not result in any major oil or gas field discoveries. As measured by the 975 exploratory wells drilled during 1971, the level of exploratory activity declined some 5 per cent from 1970. Exploratory footage, which totalled some 4,200 thousand feet in 1971, declined approximately 6 per cent from the level of the previous year. In addition, the average depth of exploratory wells decreased to some 4,300 feet from 4,360 feet in 1970. However, the proportion of successful exploratory wells drilled in 1971 increased slightly to 29 per cent as compared to 26 per cent in 1970.

Development

The total number of development wells drilled in 1971 increased to 875 from 824 in 1970. Successful oil wells drilled declined slightly from 243 in 1970 to 235 in 1971 while the number of successful gas wells declined to 325 in 1971 as compared to 399 in 1970. Development footage drilled increased some 8 per cent during 1971 to 3,700 thousand feet, as compared to 3,417 thousand feet in 1970. The average well depth increased from 4,150 feet in 1970 to 4,230 feet in 1971.

Development drilling for oil in 1971 was concentrated primarily in the Countess and Grand Forks areas. Most of the development drilling for gas occurred in the Medicine Hat, Alderson and Dunvegan areas.

Reserves

Initial recoverable conventional crude oil reserves increased by some 54 million barrels in 1971 to reach a total of 10,970 million barrels at year end. For the second year in a row, annual production of conventional crude oil exceeded the reserve additions. As a result, the remaining recoverable reserves of conventional crude oil declined from 7,603 million barrels at year end 1970 to 7,300 million barrels as of December 31, 1971.

The very modest growth in initial recoverable oil reserves reflects in part the fact that there were no major discoveries in 1971. Primary recovery operations were the most important factor contributing to the growth in 1971 and, in total, were responsible for adding some 50 million barrels to initial recoverable reserves. Significant additions in primary reserves occurred in each of Bellshill Lake Blairmore, Erskine D-3, Simonette D-3, Golden Slave Point A, Grand Forks Lower Mannville D and Zama-Virgo pools. Reserves of pools operating under enhanced recovery schemes showed a net increase of 4 million barrels.

Initial marketable gas reserves increased by some 1.8 trillion cubic feet during 1971, reaching a total of 58.3 trillion cubic feet as at December 31. This increase in recoverable reserves was due principally to development drilling in the Dunvegan area. Production of marketable gas in 1971 totalled some 1.7 trillion cubic feet; hence, remaining marketable gas reserves increased by only some 0.1 trillion cubic feet to 45.5 trillion cubic feet (48.1 trillion cubic feet on a 1000 Btu heating value basis) as of December 31, 1971.

Remaining reserves of propane at year end 1971 totalled some 737 million barrels, an increase of approximately 88 million barrels over the 1970 level, while remaining reserves of butanes increased by some 31 million barrels to a level of 450 million barrels at the 1971 year end. The remaining reserves of pentanes plus amounted to 1,160 million barrels as of December 31, 1971, an increase of 20 million barrels from year end 1970. Thus, in total, the remaining reserves of natural gas liquids increased by some 139 million barrels during 1971 to reach 2,347 million barrels as of December 31, 1971.

Remaining reserves of sulphur amounted to 188 million long tons as at year end 1971, an increase of some 2 million long tons over the comparable 1970

level.. These volumes do not include the sulphur expected to be recovered by the processing of oil sands.

Crude Oil Productive Capacity

The Board's assessment of the Province's light and medium conventional crude oil productive capacity which will be included in detail in the Board's 1971 Reserves Report has not been completed. However, the Board has had the opportunity of assessing and where appropriate, modifying, a recent survey of this matter by industry. The Board believes the year-end estimates outlined below to be realistic appraisals of the various light and medium conventional crude oil productive capacities.

1. Peak Value of Maximum Efficient Reservoir Capacity: some 2.20 million barrels per day.
2. Developed Well Head Capacity: some 1.63 million barrels per day.
3. Developed Capacity Adjusted for Field and Processing Facility Limitations: some 1.28 million barrels per day.
4. Developed Capacity Adjusted for Pipe Lines System Limitations: some 1.28 million barrels per day.

The Board applies a reduction of 5 per cent to the Developed Capacity adjusted for Pipe Line System

Limitations, in order to calculate the Province's conventional light and medium crude oil Operational Capacity which was estimated by the Board at some 1.22 million barrels per day for December 31, 1971, an increase of approximately 4 per cent over the estimate at the end of 1970.

The total availability of all types of Alberta oil, including pentanes plus (including condensate) and synthetic crude oil was estimated by the Board at 1.44 million barrels per day as of December 31, 1971.

Production and Markets

In 1971, average daily production of conventional crude oil reached 975 thousand barrels, an increase of some 83 thousand barrels or 9 per cent over the comparable 1970 level. Production of synthetic crude oil from the Great Canadian oil sands plant averaged some 42 thousand barrels per day in 1971, compared to 33 thousand barrels per day in 1970. Pentanes plus production increased by some 8 per cent in 1971 to average 126 thousand barrels per day, as compared to 117 thousand barrels per day in 1970.

Exports of Alberta crude oil and pentanes plus (including condensate) to the United States amounted to some 616 thousand barrels per day during 1971, an

increase of some 55 thousand barrels per day, or 10 per cent over the 1970 average. The increased oil shipments to the United States in 1971 were to a significant extent attributable to an increase in the quota placed on Canadian exports of crude and unfinished oils to markets east of the Rockies. This quota, which restricted Canadian exports to 395 thousand barrels per day in 1970, was raised to 450 thousand barrels per day and subsequently to 475 thousand barrels per day effective January 1, 1971.

Canadian demand for Alberta crude oil and pentanes plus amounted to some 520 thousand barrels per day in 1971, an increase of approximately 9 per cent over the 1970 level of 476 thousand barrels per day. Alberta's share of the total requirements for Canadian oil west of the National Oil Policy line increased to 70 per cent in 1971 from 68 per cent in 1970. Demand for Alberta oil, including pentanes plus, within Alberta averaged some 115 thousand barrels per day in 1971, an increase of some 4 thousand barrels per day over the 1970 level.

Gross production of raw natural gas, net of the amounts returned to formation, totalled 2,125 billion cubic feet in 1971, an increase of almost 10 per cent over the 1970 level. Alberta's marketable gas production amounted to some 1,700 billion cubic feet in 1971 as compared to some 1,525 billion cubic feet in

1970, an increase of about 11 per cent. Deliveries of Alberta natural gas totalled some 1,600 billion cubic feet in 1971, an increase of approximately 8 per cent over the levels of the previous year. Canadian demand increased by 100 billion cubic feet in 1971 to some 900 billion cubic feet while exports to the United States increased by a similar amount to total 700 billion cubic feet in 1971. The balance of the marketable gas production in 1971 was accounted for by the requirements of gas reprocessing plants within Alberta, fuel and losses of pipe lines both within and outside the Province and storage operations.

Production of both propane and butanes increased significantly during 1971. Propane production averaged some 62 thousand barrels per day, an increase of about 13 per cent over the 1970 level while the production of butanes increased by almost 18 per cent to total some 40 thousand barrels per day. These increases are a reflection of the rise in natural gas production and also of more extensive gas processing and recovery due to new plants and expansion of existing gas plants. Deliveries of Alberta propane to Canadian consumers represented some 48 per cent of the total volumes marketed in 1971 with shipments to the United States and offshore markets accounting for 39 and 13 per cent, respectively.

Domestic sales of Alberta butanes totalled some 16 thousand barrels per day in 1971 while export sales to the United States averaged 24 thousand barrels per day.

Alberta's production of sulphur in 1971 increased by approximately 7 per cent to 4.5 million long tons. Deliveries of sulphur in 1971 declined for the first time since 1966 to a gross total of only some 2.7 million long tons. Sales to United States and off-shore markets decreased from 1970 levels by some 16 and 23 per cent, respectively. However, this decline was to a certain extent offset by the fact that Canadian markets absorbed some 0.6 million long tons in 1971, an increase of approximately 15 per cent over the 1970 level.

Conservation Activity

Developments in Oil

The development of more effective enhanced recovery techniques for application in oil pools in Alberta is an important element in the growth of the Province's reserves. In this regard some 50 applications for new enhanced recovery schemes were considered in 1971.

Following a relatively quiet year in 1970, renewed interest was shown in experimental schemes to develop

oil sands during 1971. In December 1971, the Board reported on an application by Atlantic Richfield Canada Ltd., Canada-Cities Service Ltd., Gulf Oil Canada Limited and Imperial Oil Limited (the Syncrude group) to amend the applicant companies' 1969 authorization whereby they were granted approval to construct a plant capable of producing 80 thousand barrels per day of synthetic crude oil, specialty fuel oil and naphtha. The Syncrude group requested that the 1969 approval be amended to allow for the production of 125 thousand barrels per day of synthetic crude oil and 5.5 thousand net barrels per day of residual fuel oil. In ERCB Report 71-F-OG* the Board stated its belief that the volumes of synthetic crude oil applied for would supplement and not displace conventional oil production.

Developments in Gas and Propane

In January 1971, the Board reported on the applications of Alberta and Southern Gas Co. Ltd., and Consolidated Natural Gas Limited in OGCB Report 71-A**. As the result of the Board's findings, the permits of Alberta and Southern and Consolidated were

* In the matter of an Application of Atlantic Richfield Canada Ltd., Canada-Cities Service, Ltd., Gulf Oil Canada Limited and Imperial Oil Limited Under Part 8 of the Oil and Gas Conservation Act, December, 1971.

** In the Matter of an Application by Alberta and Southern Gas Co. Ltd., and in the Matter of an Application of Consolidated Natural Gas Limited Both Under the Gas Resources Preservation Act, 1956. January, 1971.

amended to allow for the removal of an additional 1,253 and 996 billion cubic feet of gas, respectively. During 1971, the Board also heard an application by Trans-Canada Pipe Lines Limited to amend its existing gas removal permit. The Board reported on the Trans-Canada application in ERCB Report 71-D-OG* and found that the applicant had 410 billion cubic feet of the volume applied for under contract and that this volume was surplus to the present and future needs of the Province and to the existing permit requirements.

The Board heard its first application to export ethane from the Province during 1971. The application, submitted by Dome Petroleum Limited and Amoco Canada Petroleum Ltd., was reported on by the Board in ERCB Report 71-E-OG** dated December, 1971.

In OGCB Report 71-B*** the Board reported on the 1970 hearing into Alberta's future gas requirements. It estimated that gas volumes totalling 15,770 billion cubic feet (1000 Btu per cubic foot) would be required to supply the anticipated residential,

* In the Matter of an Application of Trans-Canada Pipe Lines Limited Under the Gas Resources Preservation Act. December, 1971.

** In the Matter of an Application for a Permit Authorizing the Removal of Ethane from the Province of Dome Petroleum Limited and Amoco Canada Petroleum Company Ltd. Under The Gas Resources Preservation Act.

*** Report and Decision Regarding Alberta's Future Requirements For Gas. February, 1971.

commercial, and industrial demands as well as the operating requirements of the Provincial gas utility companies and the permit-related requirements for the 30-year period commencing January 1, 1970.

The Board also considered applications from Dome Petroleum Limited and TransCanada GasProducts Ltd., and Dome Petroleum Limited and Amoco Canada Petroleum Company Ltd. respecting the removal of propane from the Province. The report on these applications was being completed at year end.

During the latter part of 1971, the Board heard an application by the Independent Petroleum Association of Canada for modifications to the current oil proration plan. The Board's decision on this application is pending.

Gas conservation projects were initiated in the Gilby, Joffre and Medicine River fields and extended in the Pembina, Swan Hills and Willesden Green fields. In addition, new gas processing plants were approved by the Board for the Countess, Delburne, Fort Saskatchewan, Hartell, Hussar, Joffre, Leduc-Woodbend, Pembina, Phoenix, Rainbow, Willesden Green and Zama areas. Expansions to 14 previously approved plants were also authorized as well as minor modifications to 7 other plants.

Government Revenue

Total Government revenue from oil and gas mineral rights totalled \$270 million in 1971, a 24 per cent increase over the 1970 level of \$218 million. The 1971 total reflects rental payments of \$70 million, an increase of \$14 million from 1970; royalty payments of \$175 million, an increase of \$39 million; and revenue from Crown Reserve sales of \$25 million, a decrease of approximately \$1 million.

Industry Revenue

Revenue to the oil and gas industry from sales during 1971 totalled some \$1,513 million, an increase of approximately 16 per cent over the 1970 level of \$1,304 million. Sales of crude oil and pentanes plus again continued to yield the largest revenue and rose by some 19 per cent from \$991 million in 1970 to \$1,182 million in 1971. Sulphur revenue decreased from \$27 million in 1970 to some \$19 million in 1971. This decline in sulphur revenues was attributable partly to a 13 per cent decline in the volume of sales and partly to the continuing decline in the average selling price. Industry revenues from sales of gas, propane and butanes totalled \$311 million in 1971, an increase of some 9 per cent over the previous year when revenues amounted to \$285 million. During 1971, gas revenues totalled some \$263 million, an 8 per cent rise over 1970; propane

revenues increased some 15 per cent to total \$30 million in 1971; and revenues from butanes sales totalled some \$18 million, approximately 21 per cent higher than in 1970.

II THE ALBERTA HYDRO AND ELECTRIC INDUSTRY IN 1971

Development

During 1971, the Bighorn hydro development on the North Saskatchewan River south-west of Rocky Mountain House proceeded towards its scheduled completion in 1972 at an estimated cost of \$43,000,000. With the possible exception of the construction at the Bearspaw reservoir, to connect it to the Calgary water supply system, this was the only hydro development activity of any consequence during 1971, a reflection of the fact that the Alberta electric industry is based largely on generation of electric energy from coal and gas-fired thermal plants. The 1971 capital cost of such plants was about half that of hydro projects and 1971 was also a year in which large gas turbine driven generators, comparable to hydro machines in output, were available on a mass production basis at capital costs even lower than those of gas-fired thermal stations.

Construction work continued throughout the year on the second 300 megawatt coal-fired generating unit at the Sundance plant on the south side of Lake Wabamun and also on the first 140 megawatt coal-fired unit at the Milner plant near Grande Cache. These two projects plus the Bighorn development represent a net

capability of some 535 megawatts or about 25 per cent of the 1971 Provincial peak load, and when completed, will produce some 3,150 gigawatt-hours of energy, equivalent to about 30 per cent of the 1971 Provincial electrical energy requirement.

A major transmission line with a capability of over 200 megawatts was completed and energized at 240 kilovolts to carry energy between the Red Deer area and Calgary. Preliminary work began to provide a major expansion of the 240 and 138 kilovolt facilities serving the East Edmonton industrial area and to provide a new interconnection from these facilities to the interconnected system to the Clover Bar gas-fired thermal plant.

The Board, in a decision discussed in its report 71-C-HE, approved the application for the installation of the second 150 megawatt unit at the Battle River coal-fired thermal plant near Forestburg. This unit is scheduled for commercial operation in 1975 and will increase the plant capability to 362 megawatts.

Energy Generation

The 1971 Provincial system annual peak load of 1950 megawatts occurred between 5:00 and 6:00 p.m. on December 15th, and at that time the Provincial system was also feeding 21 megawatts to the B.C. Hydro and Power

Authority's East Kootenay area. The total energy requirement of 10,307 gigawatt-hours generated was slightly under the forecast requirement of 10,500 gigawatt-hours but still represented a high rate of growth of 11 per cent more than the requirement generated in 1970. The five generating utilities produced the 1971 energy requirement in the following proportions: Lethbridge 1.3 per cent, Medicine Hat 2.3 per cent, Canadian Utilities, Limited 12.0 per cent, Edmonton Power 21.0 per cent, and Calgary Power Ltd. 63.4 per cent. Thermal generation produced 88.4 per cent of the energy requirement, and hydro the remaining 11.6 per cent.

With the exception of a few locations, such as Fort McMurray and Jasper, which are served by isolated generation, all of the electric energy consumers and the electric generation sites in Alberta are interconnected by transmission and distribution systems. The latter systems serve many large areas with relatively few consumers but with rapidly growing energy requirements. This makes comparison with more mature, slower growth systems questionable.

Each year a larger proportion of the electric energy requirement is provided by thermal generation, both coal and gas-fired, and the relatively fixed amount of hydro

energy available from the Bow and North Saskatchewan River systems is used to maintain flexibility of system operation and to meet peak loads and short term emergencies. During 1971, three large coal-fired thermal plants were operated, two on Lake Wabamun, west of Edmonton and one on the Battle River near Forestburg. Two large gas-fired thermal plants were operated in Edmonton and two smaller plants produced electric energy in Lethbridge and Medicine Hat. Gas turbines and small oil-fueled engines at various locations produced the remainder of the non hydro generated electric energy.

III THE ALBERTA COAL INDUSTRY IN 1971

Exploration and Development

Although statistics indicative of exploration intensity, such as the number of holes drilled, total footage drilled and exploration expenditures are not available, coal exploration and development drilling continued throughout the Province in 1971, and was concentrated in the bituminous coal fields of the Mountains and Foothills regions.

Significant mine development included the opening of the Walker open-pit mine at Canmore and the development of McIntyre's No. 8 open-pit mine at Grande Cache to supplement underground coal production. Both open-pit and underground operations at Coleman were expanded in 1971 to provide for an increase in production of 0.5 million tons per year.

Reserves

The Board has not to date prepared estimates of Alberta's coal reserves. It does, however, plan to undertake an extensive study of this matter in 1972. Statistics presented by B. A. Latour to the 22nd Canadian Conference on Coal (1970) indicate that Alberta's ultimate reserves of bituminous and sub-bituminous coal are in the order of 37.3 and 9.9 billion tons respectively. Measured (proven) reserves

of bituminous coal were estimated to be 1.0 billion tons and of sub-bituminous coal, 1.2 billion tons.

Production and Markets

Contracts with the Japanese steel industry for the supply of bituminous coking coal totalled 5.0 million tons per year at the end of 1971, including an additional 0.5 million tons per year to be supplied by Coleman Collieries beginning in 1972. These contracts and the increasing demand of the electric utilities industry in Alberta for sub-bituminous thermal coal are reflected in the record 1971 Alberta coal production of 8.9 million tons valued at 41.8 million dollars. The previous record production of 8.8 million tons was established in 1946. The 1971 production represents an increase of 31 per cent or 2.1 million tons over 1970. Bituminous coal production increased by 59 per cent over 1970 to 4.5 million tons valued at 34.8 million dollars. Sub-bituminous coal production increased 10 per cent over 1970 to 4.4 million tons valued at 7.0 million dollars.

Personnel Training

Of special significance in 1971 was the introduction of a training program for coal miners, utilizing the facilities and knowledge of the coal industry, and supported jointly by the Alberta Department of Advanced Education and the Manpower Division of the Federal Department of Manpower and Immigration.

The Board assisted the coal industry in making arrangements with the Northern and Southern Alberta Institutes of Technology for new programs for the training of Coal Mining and Coal Processing Technicians. These programs are expected to be launched in 1972.

IV RESPONSIBILITIES AND FUNCTIONS OF THE BOARD

The Board is established by The Energy Resources Conservation Act. It is charged with the administration of The Oil and Gas Conservation Act, The Gas Resources Preservation Act, The Turner Valley Unit Operations Act, and The Hydro and Electric Energy Act. Additionally, it may be called upon to supply information and advice to the Department of Mines and Minerals. The Chairman of the Board is a member of the Gas Utilities Board.

The purposes of The Energy Resources Conservation Act are

- (1) to provide for the appraisal of the reserves and productive capacity of energy resources and energy for the Province;
- (2) to appraise market requirements for Alberta energy resources both within and outside of the Province;
- (3) to effect the conservation of, and to prevent the waste of, the energy resources of Alberta;
- (4) to control pollution and ensure environment conservation in the exploration for, processing, development and transportation of energy resources and energy;
- (5) to secure safe and efficient practices in exploration, processing, development and transportation of the energy resources of the Province;

- (6) to provide for the recording and dissemination of information regarding Provincial energy resources; and
- (7) to provide agencies from which the Lieutenant Governor in Council may receive information, advice and recommendations regarding energy resources and energy.

The Board employs appropriate personnel, including engineers, geologists and others. It maintains a head office in Calgary and five area offices serving major oil and gas regions. The Board issues regulations and orders pertaining to the oil and gas industry; the hydro and electric industry; and in other matters which come within its jurisdiction; has its staff conduct inspections and make studies; conducts investigations, holds hearings and prepares reports on any matter pertaining to any Act administered by it relating to energy and energy resources; and collects, summarizes, evaluates and publishes various data. The Board also assesses and taxes oil and gas properties to obtain a revenue to cover one-half of its expenses under The Oil and Gas Conservation Act.

If advisable, the Board will also recommend to the Lieutenant Governor in Council such measures as it considers necessary in the public interest related to the exploration for, production, development, conservation, control, transportation, transmission, use and marketing of energy and energy resources.

The purposes of The Oil and Gas Conservation Act,
are

- (1) to effect the conservation of and prevent the waste of the Province's resources in oil, gas and crude bitumen. (the hydrocarbon bearing mixture extracted from oil sands);
- (2) to secure the observance of safe and efficient field practices;
- (3) to afford each owner of oil and gas the opportunity of obtaining his share of production of any pool;
- (4) to provide for the recording and dissemination of information regarding oil, gas and crude bitumen resources of Alberta; and
- (5) to prevent and control pollution above, at, or below the surface in oil, gas and crude bitumen field operations and other operations over which the Board has jurisdiction.

The Board's major functions provide for the application of sound engineering and economic principles in oil and gas field operations so that the recovery of oil or gas from a pool is not lessened, enhanced recovery techniques are used where suitable and that waste of natural gas is minimized. The Board is required to ensure that oil and

gas field operations are so conducted that pollution to the atmosphere, the surface or underground formations containing water, oil or gas, is prevented or kept to a minimum.

Under the Oil and Gas Conservation Act, the Board also is charged with the examination of schemes, either of an experimental or commercial character, for obtaining production from oil sands. In this the Board is concerned with the prevention of waste of these resources, the control of pollution and the orderly development of oil sands so that the production will supplement but not displace conventional crude oil.

The Turner Valley Unit Operations Act empowers the Board, upon application, to order a part of the Turner Valley Rundle Pool to be operated as a unit. Under this Act, four oil productive and one gas productive units have been established encompassing substantially all of the Turner Valley Field.

The purpose of The Gas Resources Preservation Act, is to provide for the effective utilization of the gas resources of the Province, having regard to the present and future needs of persons within the Province. For this purpose, the Board must, from time to time, determine the volumes of established reserves of gas and propane in the Province and the trends in growth and discovery of gas and propane reserves and the present and future needs

for gas and propane within the Province. Applications for permits for the removal of gas or propane from the Province are considered in the light of such determinations and may be granted subject to the approval of the Lieutenant Governor in Council.

The purposes of The Hydro and Electric Energy Act, are

- (1) to provide for the appraisal of reserves and productive capacity of hydro energy and electric energy in the Province;
- (2) to appraise requirements for electric energy within Alberta and of markets outside Alberta for electric energy generated in the Province;
- (3) to ensure the economic, orderly and efficient development in the public interest of hydro energy and the generation of electric energy in Alberta;
- (4) to secure safe and efficient practices in the public interest in the development of hydro energy and in the generation, transmission and distribution of electric energy;
- (5) to control pollution and to ensure environment conservation in the development of hydro energy and in the operation, transmission and distribution of electric energy; and
- (6) to provide for the recording and dissemination of information regarding hydro energy and the

generation, transmission and distribution of electric energy in the Province. The responsibility of the Board also extends to protecting the public by taking appropriate safety measures for any power plant or transmission line, including their construction, operation, record keeping and abandonment.

During 1971 the Board made preparations for the administration of The Coal Mines Regulation Act, The Quarries Act and The Pipe Line Act. A proclamation assigning the responsibility for the administration of these Acts was made, effective January 1, 1972.

In carrying out its functions, the Board and its staff frequently confer with and co-operate with those Departments of the Government having functions relating to matters with which the Board must deal. This has proved particularly useful in the areas of safety requirements and pollution control.

V ORGANIZATION AND STAFF

As a result of the enactment of the Energy Resources Conservation Act effective June 1, 1971, provision was made for the expansion of the Board from three to five members. The Chairman's position remained essentially unchanged; the position of Deputy Chairman was renamed Vice Chairman and two such positions were created and filled; an additional Board Member position was added to the one already in existence, and these two positions were also filled. The Lieutenant Governor in Council makes the appointment of each of the five positions for a five year term and thereafter at his pleasure.

The Solicitor serves as a senior adviser to the Board. He provides the Board with legal assistance and advice and, when appointed for the purpose, he may function as an acting Board Member. The Staff Engineer also reports directly to the Board, and is responsible for such items as the annual budget recommendation, educational assistance plan and several annual Board publications and other matters which may be assigned by the Board. During 1971 the position of Technical Assistant to the Chairman was created and filled. The Technical Assistant is directly responsible to the Chairman and assists him with a variety of technical and administration matters. An Applications Advisory Group, under the chairmanship of the Solicitor and including the

Managers of the Gas, Oil and Development Departments, advises the Board directly on routine applications. In addition, members of this group, and other senior staff, may be appointed by the Board to act as examiners at public hearings. An Organization Chart of the Board is presented in short form on the inside back cover of this report.

Two departments were added to the organization as a result of the increase in responsibilities of the Board provided for in the new Act. The eleven present Board departments, each headed by a Manager, range in size from a complement of 85 in the Development Department to two in the Coal Department. Each Manager is responsible for ensuring the discharge of functions and responsibilities assigned to his Department as summarized in Chapter VII of this report.

The Development, Oil, Gas, Hydro and Electric and Coal Departments are the major line Engineering Departments.

The Development Department is responsible for reviewing or approving well licensing and abandonments, casing requirements, well testing frequencies, measurement requirements, multi-zone completions, and other related subjects. It is also responsible for Area Offices which are staffed by engineers and technicians. These offices are located in Edmonton, Red Deer, Drayton Valley, Medicine Hat, and Black Diamond. Their primary responsibilities are to

inspect and report on drilling and production procedures in oil and gas fields, and to investigate environmental control problems as they relate to Alberta energy industries. In addition, the Board maintains a Chemical Laboratory on the University of Alberta campus with the Chief Chemist reporting to the Assistant Manager of Field Operations. The laboratory staff conducts a variety of analyses as well as providing advice on chemical and analytical matters.

The Gas Department assists the Board in its administration of The Gas Resources Preservation Act and is primarily responsible for reviewing pollution control problems concerning gas processing plants. The Gas Department also reviews the present and estimated reserves and deliverability of gas, natural gas liquids, and sulphur in Alberta.

The Oil Department maintains an over view of oil recovery operations, oil sands, enhanced recovery schemes, oil well spacing, concurrent production, estimates and projections of oil reserves, maximum production rate limitations, and assists in the technical administration of the crude oil proration plan.

The Coal Department, presently in its formative stage, will review the conservation aspects of mining,

processing, and transportation of coal. This Department will also prepare regulations for permits, licences, approvals, analytical data, coal production and disposition statistics.

The Hydro and Electric Department, also recently created, will process industry applications and will develop regulations for applications and statistics pertaining to the generation, transmission and interconnections, and many other matters concerned with safety, control of pollution and the recording and dissemination of appropriate information.

The Data Processing Department is primarily responsible for computer applications and systems analysis within the organization.

The Geology Department provides technical assistance to the engineering departments. It is also responsible for the storage and evaluation of well data, core and samples, as well as preparation of reservoir and geological maps.

The Economics Department administers the crude oil proration plan with the assistance of the Oil Department and makes numerous statistical and economic studies for the Board.

The Accounting Department is responsible for the processing and publication of all production and disposition statistics for oil and gas and related products. Its role

is being expanded to cover similar work related to other energy resources. The Department also handles the Board's financial accounting.

The Office Services and the Personnel Departments complete the Board's organizational structure. These Departments provide information and service to the public and the industries served by the Board, and also provide staff assistance within the Board.

The Board complement as of December 31, 1971 was 318, which was an increase of 19 over the approved complement at the same time in 1970. This increase was due primarily to the assignment to the Board of responsibilities for Coal and Hydro and Electric energy. Also a factor in the increase is a major microfilming project which is expected to take about fifteen months to complete. Engineers, geologists, and other professional staff account for almost 25 per cent of the Board's total staff. Among the present employees, seventy-five have more than ten years of service and fifteen have at least twenty years of service with the Board.

The Board provided financial assistance to over 100 employees to attend off-premise courses during 1971.

The staff turnover rate of 13 per cent was maintained for the second consecutive year. This rate is the lowest the Board has recorded dating back to 1961. Of the 42 terminations during the year, 24 were females and 18 were males.

Arrangements with the Department of Public Works for the completion of the fourth floor of the Board's Calgary office building to relieve space pressure and to accommodate the new Coal and Hydro and Electric Departments were made and are expected to be completed early in 1972. Extensions to the Edmonton and Red Deer area offices were completed in 1971.

VI LEGISLATIVE CHANGES

The Energy Resources Conservation Act, being chapter 30 of the Statutes of Alberta, 1971 which received legislative assent on April 27, 1971, re-constituted the former Oil and Gas Conservation Board as the Energy Resources Conservation Board. The change expanded the number of Board members from three to five and as well as continuing the past functions of the Oil and Gas Conservation Board, added the responsibility for hydro and electric energy within Alberta.

The Alberta Power Commission has now been replaced by the Energy Resources Conservation Board. A proclamation effective January 1, 1972 transferred responsibility from the Department of Mines and Minerals to the Board for The Pipe Line Act, The Coal Mines Regulation Act and The Quarries Act. Other than the change in administrative responsibility no changes were made to the Acts themselves. The Board will review these Acts at an early date and make any revisions deemed advisable.

The Hydro and Electric Energy Act, being chapter 49 of the Statutes of Alberta, 1971, that also received assent on April 27, 1971, gives jurisdiction to the Energy Resources Conservation Board to regulate the

electric and hydro power industry within Alberta. The Act also enables the Board to make pertinent regulations to carry out all necessary functions and activities relating to hydro and electric energy.

Regulations

By Alberta Regulation 149/71 effective June 1st, 1971, rules of practice were enacted pursuant to section 30, subsection (1) of The Energy Resources Conservation Act. With some minor changes the rules replace the previous rules of practice. They are applicable to The Energy Resources Conservation Act, The Oil and Gas Conservation Act, The Gas Resources Preservation Act, The Turner Valley Unit Operations Act, The Hydro and Electric Energy Act and other Acts under which the Board is charged with the conduct of proceedings.

These rules are to provide guidance for industry as to the form and content of any application or application intervention to the Board, and to outline general Board procedures at Board hearings.

Also during the year the Oil and Gas Conservation Regulations were amended by Regulations, in chronological order, 47/71, 151/71, and 241/71. Alberta Regulation 47/71 was of a technical nature in that it altered the normal production spacing in the Rainbow

Field effective May 1st, 1971. The major change occurred with Regulation 151/71. This was a complete republication of the Regulations with the numbering system changed to a partial decimal system for all major headings to facilitate further amendments in a more logical and systematic fashion. Other minor changes were made concurrently with the republication.

The last amendment 241/71, contained changes requiring all production from and injection to a well to be through tubing unless upon application by the licensee an exemption is granted by the Board. Also in this regulation design changes were required in well equipment to provide better environment protection from accidental pollution and ensure higher safety standards at well sites.

VII DUTIES, ORGANIZATION AND MAJOR ACTIVITIES
OF BOARD DEPARTMENTS

This part of the report deals with the composition and principal activities of the eleven Board departments. The technical departments are described first.

Before outlining the individual departmental activities, it may be interesting to know the magnitude of the overall activities of the Board in regard to registered applications. During 1971 the Board received some 600 applications of the type which it registers individually. This volume reflects little change from the number of applications filed in 1970. Such applications are those which, if approved, would result in the issuance of a Board order, approval or permit. They are exclusive of routine applications such as those for drilling licences and well allowables which are processed on a day-to-day basis. Public hearings were held in connection with 66 of the applications, 37 of them by Board members and the balance by examiners appointed by the Board. Approximately 168 of the applications were considered after giving public notice for objections and the balance, having no impact on the rights of others, were dealt with directly by the Board and its staff.

Most of the Board departments are involved with the processing of applications from time to time. In fact, the functions related to applications form a large part of the work load of the Board organization. Many of the applications require extensive technical analysis and subsequent reports to the Board. The review of the performance of approved schemes also demands considerable attention from the technical departments.

In addition to the foregoing, there are other general activities in which the Board and its staff participated. One of these is contributing to the work of technical and other specialist committees of various Government and industry organizations. Among the organizations having Board representation in 1971 were:

Public Advisory Committee on the Environment

Provincial Mines Ministers' Conference:

The Inter-Provincial Petroleum and Natural
Gas Committee

Interstate Oil Compact Commission and Committees

Alberta Petroleum Industry Training Service

Southern Alberta Institute of Technology:

Petroleum Technology Committee
Computer Technology Committee

Northern Alberta Institute of Technology:

Gas Technology Committee

NATO Wartime Oil Organization

War Supplies Agency (Department of
Defence Production)

Emergency Measures Organization

National Advisory Committee on Petroleum
Statistics

Conservation and Utilization Committee of the
Government of Alberta

Certification Board of Alberta Society of
Engineering Technologists

Helium Recovery Research Group Guidance Committee

World Petroleum Congress - Canadian Association

Petroleum Recovery Research Institute

Technical Advisory Committee to the Research
Council of Alberta

Energy Committee under The Energy Resources
Conservation Act

Natural Resources Co-ordinating Council

Canadian Natural Gas Processing Research Fund

In 1971 the Board provided short courses or seminars for representatives from India, Nigeria and the State of Alaska. Approximately 20 members of the Board staff provided some 110 man days of training.

A DEVELOPMENT DEPARTMENT

The Development Department is concerned with the Board's regulations which involve the drilling, completion and production of wells and for pollution abatement in field operations.

The Department is divided into two main Sections: the Drilling and Production Section under the Assistant Manager, Drilling & Production; the Area Offices and Chemical Laboratory supervised by the Assistant Manager, Field Operations. The responsibilities, functions and organization of the Sections are described in more detail below.

(a) Drilling and Production Section

This Section's responsibilities are to ensure the proper location of wells and, by specifying requirements for the casing, cementing, completion, and abandoning of wells, to reduce the possibility of subsurface contamination and blow-outs. The Section ensures proper measurement of produced and injected fluids, both on a pool wide and an individual well basis. It is also responsible for matters related to production such as control of air, water and soil pollution, reduction of physical waste, approval of new types of production equipment, disposal of produced water, approval and surveillance of multi-zone completions and control of common flow lines.

The major functions of the Section are

1. to process applications to drill, suspend, rework, plug back or abandon wells;
2. to specify or approve casing, cementing and completion practices;
3. to recommend disposition of applications for special drilling spacing units and compulsory pooling;
4. to maintain files and records respecting well names, unit agreements, well licences, and appointment of agents;
5. to review drilling and service rig inspection reports from the field staff, and correspond with operators regarding the inspections;
6. to co-ordinate field staff inspections of measurement and well testing procedures and production records;
7. to perform periodic audits of company production accounting methods at their central offices;
8. to deal with requests for exemption from gas or water measurement of wells or pools and requests for reduction of well testing frequency;
9. to appraise applications for water disposal schemes and recommend disposition of them;

10. to check volumes of water disposed to pits or wells to ensure the volumes are within the prescribed limits and to deal with applications to amend disposal limits;
11. to process applications for approval of sour gas batteries, to provide technical advice on pollution control, to review reports regarding air, water and soil pollution and require operators to take the necessary steps to minimize pollution from wells, batteries and gas plants; and
12. to process applications for multi-zone completions and common flow lines and schedule and evaluate segregation tests on multiple completions.

Organization and Staff

The staff consists of the Assistant Manager, a Senior Drilling and Production Engineer, two staff Engineers, six Technicians, a Clerk and four Stenographers.

Activities During the Year

Pollution control represented a considerable portion of the Drilling and Production Section's work load during 1971. This was the first year that the Board ran its own gas processing plant incinerator stack surveys. Operators of plants producing more than 100 tons of sulphur per day

or emitting more than 10 tons per day of sulphur to the atmosphere were also required to continuously monitor sulphur emission from the incinerator stack. Most of this equipment has now been installed and except for certain problem areas, the equipment is working reasonably well.

A program requiring the installation of subsurface control valves on all sour gas wells within a certain proximity of urban areas and dwellings was implemented. Operators of sour oil well batteries were required to install tanks to contain oil vented from relief valves on pressure vessels. Other regulations and directives concerning pollution control required tubing to be installed in all wells; reduced the size of salt water disposal pits and specified in more detail the construction of earthen pits used for salt water or drilling fluid storage.

Three inquiries were held, two concerning pollution of air and the other dealing with unsatisfactory battery conditions. Sixteen prosecutions were initiated during the year, fifteen for smoking and one for an open flame less than 75 feet from oil storage tanks. Fourteen of these prosecutions were successful, the other two are still pending.

A major project completed during the year was the determination of suitable accuracy standards for oil,

gas and water production data and the well testing frequency required to obtain these accuracies. Further work is being scheduled to determine what accuracies are actually being obtained.

During 1971 the Board staff supervised the re-entry of two leaking previously abandoned wells and were able to effectively plug them off so that they were properly abandoned. At one well, located in the Turner Valley Field, gas was escaping at approximately 100 Mcf/day at the surface. On re-entering the well it was found that numerous "bridges" had formed inside the production casing which, when removed, resulted in an increase of the gas volume to an estimated 20 million cubic feet per day and then gradually stabilizing at an estimated 10 million cubic feet per day.

The other well, located in the Taber area, was permitting the escape of gas and water which was eventually surfacing in an adjacent field and sterilizing a large cultivated area. In order to control this flow it was necessary to drill a relief well to a depth of 700 feet so that the originating zone of the gas and water could be properly cemented off.

The Board also participated in the Canadian Petroleum Association Oil Spill Contingency Plan, which provides for the formation of producing companies into

co-operatives in oil fields to ensure containment and rapid clean-up of spilled oil.

(b) Area Offices

The Chief duties of the area offices are to ensure that The Oil and Gas Conservation Act, the Regulations thereunder, and the various other requirements of the Board are observed by the industry at the field level. Their major activities are directed toward improvement of measurement accuracy in gas, oil and water production; safe operation of drilling and production equipment and control of pollution.

To carry out these responsibilities, there are a number of separate duties which together comprise most of the work load of the area offices.

The major duties are

1. to advise operators on the requirements of the Act, Regulations and Board policies regarding field operations;
2. to issue or approve abandonment and casing programs;
3. to check wells, batteries, measurement equipment and drilling and service rigs, segregation tests, back pressure tests, casing and abandonment operations for compliance with the regulations;

4. to calibrate subsurface pressure measuring instruments and collect oil, gas and water samples as required by the laboratory;
5. to check operators' production practices and reporting procedures and make reports on gas processing plants, salt water disposal systems, pressure maintenance projects and gas conservation schemes;
6. to inspect oil or gas field operations which might cause pollution of air, soil or water and take the necessary steps to prevent occurrence of pollution and to investigate and take appropriate action when pollution complaints are received; and
7. to prepare weekly drilling progress and re-work reports.

Organization and Staff

Five Area Offices at Edmonton, Drayton Valley, Red Deer, Medicine Hat and Black Diamond are supervised by Area Engineers or Area Supervisors who report to the Assistant Manager, Field Operations in Calgary.

At the end of 1971, the total field staff complement consisted of two Engineers, 54 Technicians and Clerks and six Stenographers.

Activities During the Year

Pollution control continued to be a major factor in the Board's field work. An incinerator stack survey unit was assembled to measure sulphur dioxide emissions from gas plants. Surveys were completed on twenty-two of the thirty-eight sour gas processing plants.

Drilling rig inspection objectives were essentially met but production operation surveillance fell below the planned level.

Major internal work changes were the introduction of a computer-assisted system for lease inspections, a start on in-depth investigations of sour gas plant operations, the beginning of programs to improve pollution control at drilling sumps and bringing environmental conditions in oil fields such as Turner Valley up to present standards. The computerized lease inspection system assists in scheduling, provides cards on which inspection results are noted, prints notices to well owners regarding the inspection results and retrieves selected summary data on the results of inspections.

(c) Chemical Laboratory

The duties of the Chemical Laboratory are to collect assess, classify and file the results of gas and fluid analyses submitted by well owners for liquid and gas

samples from wells drilled outside of designated fields in addition to those required for all pools. From these data sources, representative analyses for most of the oil and gas production zones of the Province are selected and published. The Laboratory's major analytical investigations are related to production, disposal, pollution or pressure maintenance problems encountered by the field staff. Some analytical work is forwarded to other laboratories - Government, University or Commercial, for special analyses requiring different or more sophisticated equipment than that available in the Board's Laboratory. Facilities are made available to the University of Alberta and the Chief Chemist provides a limited amount of assistance with research projects for both the University and the Research Council of Alberta.

Organization and Staff

At the end of 1971 the staff complement consisted of two Technicians and two Typists supervised by the Chief Chemist.

Activities During the Year

A total of 610 analyses were performed during the year, 30 of which were water, oil or gas analyses from producing pools. The remaining 580 analyses were related

to pollution control problems such as drilling sump fluid disposal, surface casing flows, domestic water pollution investigations and special studies. Of the 415 drilling sump and farm water samples received, 235 were also "trout tested" by the Department of Lands and Forests laboratory. About one-half of the above drilling sump samples were collected by the Department of Lands and Forests for appropriate analysis as discussed above.

B OIL DEPARTMENT

Responsibilities and Functions

The Oil Department is concerned with matters affecting conservation and correlative rights in crude oil production operations. It is responsible for the assessment of enhanced recovery schemes, concurrent production schemes, reserves and productive capacity of oil pools, oil well spacing, oil sands schemes, experimental schemes, and technical matters relating to the proration plan.

The principal functions of the Oil Department are

1. to determine initial and remaining oil reserves, reserves growth trends and maximum rate limitations of production;

2. to ensure that adequate sample density and measurement standards are achieved respecting oil pool reservoir fluid analyses, normal core analyses, special core analyses, fluid interface measurements and reservoir pressure measurements;
3. to review the performance of all oil pools and enhanced recovery schemes therein, and recommend to the Board means of improving conservation in pools where it is feasible;
4. to assess applications for enhanced recovery schemes, concurrent production schemes, pilot tests and commercial and experimental oil sands schemes, and assess in co-operation with other departments, applications concerning water disposal and production measurement;
5. to assess applications and prepare Board orders or approvals respecting oil well drilling spacing units, production spacing units, blocks and projects and related matters;
6. to initiate Board orders for fields and pools; to maintain records as required for the everyday administering of crude oil production allowables;

7. to advise the Board respecting ultimate reserves, recovery factor modifiers and maximum rate limitations;
8. to advise the Economics Department in the preparation of the monthly crude oil production allowable order; and
9. to develop and sustain special technical capability needed to perform advanced reservoir studies, e.g. petrophysics, reservoir simulation, transient well flow, solvent and thermal recovery methods, etc.

Organization and Staff

The Oil Department is separated into two Sections. The Reserves Section is responsible for evaluation of oil reserves, oil productive capacity and maximum rate limitations, and for assessment of applications respecting concurrent production, oil well drilling spacing units, production spacing units, blocks and projects. Also within the Reserves Section are technical specialists concerned with petrophysics, reservoir fluid properties and reservoir simulation techniques.

The Projects Sections is responsible for evaluation of proposed enhanced recovery schemes, promoting implementation of and surveillance of enhanced recovery

operations in conventional crude oil pools and surveillance of oil sands recovery schemes and experimental schemes. Also within the Section are specialists in solvent and thermal recovery methods and transient well flow phenomena.

During 1971, the Oil Department staff included 19 Engineers, 21 Technical Clerical Assistants, two Stenographers and two Typists.

Activities During the Year

(a) Reserves Section

During 1971 the Section processed approximately 60 reserves submissions and 140 applications for new well allowables - a significant reduction from the last few years.

The growth in Provincial reserves, exclusive of enhanced recovery additions, was some 50 million barrels in 1971 compared to 5 million barrels in 1970 and minus 25 million barrels in 1969 whereas it was 480 million barrels in 1968 during the peak of the Keg River play. The 50 million barrel net gain in primary reserves includes allowance for significant reductions in reserves made during the year in several pools in the Rainbow-Zama area. A significant increase in reserves occurred pursuant to a revised reserves evaluation in the Bellshill Lake Blairmore Pool. It is now believed that ultimate

recovery may approach 30 per cent under primary depletion by drilling additional infill wells and judicious re-completion of wells as the water cone rises at each well bore.

Applications for well spacing (including infill drilling) increased somewhat compared with the previous year and this trend is expected to continue as the need to replace wells that have been flooded out increases, as pools are depleted and as market demand increases. Applications for such other matters as good production practice, annual accounting, gas-oil ratio penalty relief and down hole commingling continued at the same pace as the previous year. While the total number of concurrent production applications was lower than in the preceeding year, the applications received in most instances involved large, important pools.

Concerning mathematical reservoir simulation, there was a considerable increase in both the Board's ability to conduct independent studies and it's skill and knowledge in assessing studies submitted. The staff now possesses capability to do multi-dimensional model studies, coning studies and volatile fluid studies. The group conducted about 18 simulation studies and provided in-depth review and consultation to the staff in 10 other cases.

A detailed investigation of the literature, theory and practice of the effect on ultimate crude oil recovery of production rate was commenced. The objective will be to provide a supplement or alternative to the present maximum rate limitation policy and introduce more sophistication and technical applicability with regard to the determination of maximum rate limitations.

Activities in petrophysics and proration matters continued at a normal level.

(b) Projects Section

Activities in the Projects Section were similar to that of the preceeding year. Some 50 applications for new enhanced recovery schemes, 6 applications to terminate schemes and 140 amendments to existing schemes were processed.

The major items of interest regarding various types of enhanced recovery schemes are summarized below.

Incremental enhanced recovery reserves assigned during 1971 as a result of full implementation of the approved schemes totalled some 38 million barrels. Although there were no large enhanced recovery schemes initiated in 1971 the schemes in the Pembina Keystone Belly River U Pool and two schemes in the Willesden Green Cardium A Pool accounted for about one-half of the 38

million barrel total. In addition, other enhanced recovery schemes were approved in 1971 and are in various stages of implementation (the Board's policy is not to assign reserves in such cases until the approved scheme has been fully implemented for not less than 90 days). These will result in the assignment of some 75 additional million barrels in 1972. Not included in the 75 million barrel total is an application for a solvent flood in the Rainbow Keg River AA pool which is presently being processed. Preliminary calculations show that a further additional assigned reserve in the order of some 40 million barrels may be assigned to this scheme some time in 1972. Also, five small, but prolific oil pools in the Countess area of southern Alberta have been approved for water flooding and the schemes are presently being implemented. When fully implemented in accordance with the approvals for 90 days, these pools will be assigned an additional reserve in the order of 40 million barrels in 1972.

Offsetting a major portion of increased reserves assignments in 1971 were two significant decreases. A reduction of 70 million barrels of assigned recoverable reserves occurred in the Pembina Cardium Pool following a careful review of all water flood operations in that pool. While the review resulted in no general change in the Board's outlook for water flood recovery

efficiency, the decrease in assigned reserves resulted from a downward adjustment of some 300 million barrels of oil in place within water flood areas. A few water flood schemes have already ceased injection operations and reverted back to primary recovery operations. This is quite significant in that this has been done at a very early stage of depletion in a number of the schemes. A downward adjustment in recovery percentage for the Crossfield Cardium water flood from 15 per cent to 11 per cent, on the basis of performance, resulted in a reduction of 7 million barrels of recoverable reserves. It now appears that initial predictions of water flood results of several Cardium sand bar accumulations have erred considerably on the high side.

Detailed performance reviews of 12 mature enhanced recovery projects were completed in 1971. Three of these were horizontal solvent floods, one vertical gas flood and eight pattern or line drive water floods. The majority of these were found to be conforming to performance predictions, but in two or three of the cases downward revisions will probably be effected in 1972. They are not expected to be serious.

Surveillance of enhanced recovery operations continued to grow in 1971 commensurate with the increased number of

enhanced recovery projects in operation. Monthly surveillance of replacement ratios, gas-oil ratio performance and pressure conditions in some 300 enhanced recovery schemes were maintained. The surveillance revealed 30 cases where operational problems or adverse performance had developed and in nine of the cases the recovery factor modifier was withdrawn until the problem could be rectified.

Experimentation with thermal recovery methods in oil sands and heavy crude oil deposits continued at an increased pace during 1971. Respecting commercial oil sands recovery schemes, production at the Great Canadian oil sands plant continued to improve, reaching an average rate of some 42 thousand barrels per day of synthetic crude oil during 1971 as compared with 33 thousand barrels per day during 1970. The Board heard and subject to the concurrence of the Lieutenant Governor in Council will approve an application by the Syncrude group to increase the permitted rate of synthetic crude oil and related products production from it's proposed plant (slated for commencement of operation in 1976) from the presently approved level of 80 thousand barrels per day to a revised level of 125 thousand barrels per day.

The Board staff annually reviews primary depletion pools to determine if adequate measures are being taken to implement enhanced recovery operations where feasible

and in 1971 this review was focused on efforts to promote a basin-wide co-operative water injection scheme in the Zama area plus a review of some 30 primary depletion pools scattered throughout the remainder of the Province. Among the latter group only nine pools were considered potential candidates and proposals will be taken up with the operators early in 1972.

The work completed by the bottom hole pressure group was much the same as that in 1970.

Significant matters of policy in which the Oil Department was involved during 1971 included: economic conservation issues and concepts (as in Olds, Harmattan Elkton, and Judy Creek Viking); maximum rate limitations for light and medium crude oil pools; infill wells in projects; proper methods of sampling of oil reservoir fluids; and revisions to maximum rate limitation regulations to provide operating flexibility and reduce administrative surveillance.

Turnover in engineering and technician staff was modest during 1971. The technical proficiency program was reasonably successful in 1971. Participation in courses, seminars and conferences during 1971 amounted to 320 engineer days and 250 technician days of Board contributed time complemented by 170 engineer days and

260 technician days of personal time. Overall, this is equivalent to on the job time of about 8 per cent for engineers and 6 per cent for technicians and off the job time of 4 per cent for engineers and 6 per cent for technicians.

C GAS DEPARTMENT

Responsibilities and Functions

The Gas Department is concerned with the conservation of gas and related products including propane, butanes, pentanes plus and sulphur. The Department is also responsible for the determination for the Province of the reserves and deliverability of gas, natural gas liquids and sulphur. In addition, it assesses the availability of gas to meet the long term requirements of the various utility systems in the Province and the existing commitments for the removal of gas from the Province. The Department also has certain pollution control responsibilities related to the production and processing of gas. The major duties related to the Oil and Gas Conservation Act are

1. to determine reserves in all pools throughout the Province of gas, propane, butanes, pentanes plus and sulphur and the reserve growth trend for gas;

2. to establish permissible rates of production for gas wells, to determine frequency of gas well tests and to prescribe methods of testing wells and calculating flow potentials;
3. to make studies of the need for the installation of gas conservation schemes and to review the performance of all established schemes;
4. to assess the need for gas cycling schemes to conserve natural gas liquids, to review the performance of existing cycling schemes and to assess the suitability of proposed schemes for the depletion of gas pools;
5. to assess from a conservation viewpoint the suitability of proposed gas processing facilities and to review the performance of existing gas processing facilities;
6. to establish for proposed gas processing facilities the permitted volumes of pollutants which may be emitted to the atmosphere and the conditions of emissions and to assess the measurement methods thereof;
7. to review regularly and at the request of the Public Utilities Board the requirements for and the availability of gas to small gas utility systems in Alberta;

8. to review at the request of the Department of Mines and Minerals of the Provincial Government applications to construct pipe lines and to advise the Department of the Board's findings; and
9. to review the production performance of all pools and to recommend to the Board means of improving conservation where it is deemed to be feasible.

The main duties related to the administration of The Gas Resources Preservation Act are

1. to determine the Province's reserves and reserve growth trends for gas and for propane in order to assist the Board in assessing applications for the removal of gas and propane from the Province;
2. to determine the deliverability of gas produced in fields connected or expected to be connected to markets outside of the Province; and
3. to determine the availability of propane in the Province at such times as applications for removal of propane from the Province are considered by the Board.

Organization and Staff

The Department is primarily technical in nature and is headed by the Manager. The assistant Manager is responsible for the day to day operations of the Department. The Reserves Section is responsible for the evaluation of gas reserves and the establishment of permissive rates of production for gas wells.

The Projects Section appraises proposals presented to the Board concerning the cycling of gas pools and the processing of raw gas to produce marketable gas, natural gas liquids and sulphur. It also estimates the reserves of propane, butanes, pentanes plus and sulphur and is responsible for surveillance of the existing gas utility systems.

The Conservation Section is responsible for the surveillance of existing gas processing plants and gas conservation operations in oil and gas fields and for studies of the feasibility of conserving gas produced in association with oil production.

The total Department staff comprises 11 Engineers, nine Technicians, three Clerks and a Stenographer.

Activities During the Year

The Department was involved in the consideration of 13 applications under The Gas Resources Preservation Act. These included three applications requesting the removal of an additional 5.0 trillion cubic feet of gas, two applications requesting the removal of an additional 73.8

million barrels of propane and one application requesting removal of 253 million barrels of ethane (equivalent to 728 billion cubic feet of 1,000 Btu gas). These applications resulted in some 2.7 trillion cubic feet of gas, some 60.0 million barrels of propane and 543 billion cubic feet or the equivalent of 180 million barrels of ethane being approved for removal from the Province. The remaining applications were for minor permit amendments and were granted in full. In assessing these applications and in determining year end reserves for gas, natural gas liquids and sulphur, the reserves of all pools in the Province were studied in varying degrees of detail. The gas reserves work performed during the year again utilized pressure decline to an increased extent. In addition, a study was made of gas reserves considered beyond economic reach which resulted in changing many reserves in the Rainbow-Zama area to the within economic reach category.

Among the Department's major activities during the year was a study of sulphur recovery requirements and a review of the adequacy of the emission stacks at all existing sour gas processing plants. The requirement of the Board of a monthly "sulphur balance" report, which was initiated during the latter part of 1970, proved to be very useful in these reviews.

As a result, guidelines outlining the Board's required sulphur recovery efficiency for various acid gas qualities

and sulphur inlet rates were issued. The Board expects the new guidelines to be met in most cases by the end of 1974. As a result of the review of stack heights, certain operators were contacted and investigations are being made to determine what changes may be necessary. The Department also completed its program of combining Department of Health and Board plant approvals into a single approval for each plant.

The feasibility of conserving gas produced with oil in all or part of seven fields was studied and as a result GC orders were issued for the Ante Creek, Provost and Acheson East Fields. Solution gas gathering schemes were extended in three other fields.

Forty-eight applications concerning gas processing plants were considered during the year. Of the 48 applications, thirteen were for new plants, fourteen for expansions to existing plants and seven for minor process changes. The remainder were for miscellaneous amendments to plant approvals. The largest plant considered was an expansion to the Ram River plant. This expansion will increase the raw gas capacity from 220 to 382 million cubic feet per day, and increase the sulphur recovery capacity from 2,000 to 4,100 long tons per day.

During the year the Department considered eight applications involving the cycling of gas in pools rich in natural gas liquids. No unusual problems were encountered in the processing of these applications.

The Department considered six applications related to the underground storage of gas and natural gas liquids. Three of these were for new schemes and three were for amendment of existing schemes. One new scheme approved underground storage of liquid products at the fractionation plant being built at Fort Saskatchewan. The storage will take place in underground salt caverns and will be for both fractionated and unfractionated products.

Other applications processed during the year included eight for the commingling of production from pools and ten for production of wells or pools at rates consistent with good engineering practice. Twenty-three applications involving spacing matters and eighteen involving other miscellaneous matters were also handled. The maximum permissible gas production rates for nine pools were considered at a public hearing, and orders were issued to regulate the maximum production rates at several of these pools. Studies were also made of the deliverability of pools supplying gas to local utilities and to extra-provincial markets. The long term availability of propane in the Province was also reviewed.

The Department participated in the processing of a number of applications for which other departments carried the primary staff responsibility. Typical of these were applications for the concurrent production of oil and gas

cap gas, for the solvent flooding of oil pools, for special well spacing and for modification of measurement requirements.

During the year, the Board reported on the long term requirements of the Province for natural gas. The Board's study indicated that some 15.8 trillion cubic feet (1,000 Btu's per cubic foot) of gas will be required for Alberta over the 30-year period 1970 to 2000. This volume includes some 2.5 trillion cubic feet for residential gas requirements, 2.4 trillion cubic feet for commercial gas requirements, 8.5 trillion cubic feet for industrial and contingency requirements, 149 billion cubic feet for operating requirements of gas utility companies and some 2.1 trillion cubic feet for permit-related requirements.

The Department was also involved in the Board's technical proficiency program and participated in the training programs involving new staff.

D. GEOLOGY DEPARTMENT

Responsibilities and Functions

The Geology Department is responsible for the preservation and evaluation of most basic well data, the administration of the Board's well evaluation requirements, the mapping of oil and gas reservoirs and the preparation of subsurface geological maps. Upon request, the Department undertakes special studies to assist other Board departments and the Alberta Department of Mines and Minerals.

The Department also directs the operations of the Board's Core Storage Center and the Drafting Section.

The main functions of the Department are

1. to administer the coring, logging, drill stem testing and drill cuttings requirements of the Board;
2. to receive, process and provide examination facilities for drill cuttings and core at the Core Storage Center;
3. to evaluate hydrocarbon bearing intervals at all productive wells and prepare maps to delineate the area and volume of each pool;
4. to identify, record and publish the names and depths of stratigraphic markers penetrated by all wells drilled;
5. to investigate and report on the geological aspects of submissions and other evidence filed with the Board;
6. to advise the Board, other Board departments, the Department of Mines and Minerals and other Provincial agencies on geological matters;
7. to assist the Development Department in ensuring that a water source well drilled to supply an oil field enhanced recovery

scheme does not interfere with domestic water supplies;

8. to develop and maintain regional geological maps and well location and well status maps;
9. to classify each well licensed in accordance with the Lahee classification system; and
10. to give guidance to the Drafting Section whose major responsibilities are to create and maintain well status maps, prepare charts and the like for Board publications, conferences and public talks, prepare plats for various Board orders and approvals and the preparation of all Board forms.

Organization and Staff

The Manager of the Board's Geology Department also serves as the Chief Geologist for the Alberta Department of Mines and Minerals. Within the Geology Department there are three Sections. The Geology Section comprises the Manager, the Assistant Manager, ten Geologists, three Technicians, five Clerks and one Stenographer. The Core Storage Center Section is located in a separate building. It is headed by a Supervisor responsible to the Manager of Geology and is staffed by 13 employees. The Drafting Section consists of five Draftsmen, and a Supervisor who reports to the Manager of Geology.

Activities During the Year

(a) Geology Section

Stratigraphic markers were identified and published for 1,800 wells and hydrocarbon bearing zones were evaluated for 850 wells.

An extensive review was conducted to determine whether any improvements to the Board's marker data on its magnetic tape file is desirable. A decision on this matter is expected early in 1972.

Numerous applications and submissions were received from operators on such matters as removal of gas or propane from the Province, enhanced recovery, good production practice, concurrent depletion, oil reserves and allowables, production and drilling spacing units and special target areas. All of these matters involve various amounts of geological work.

In some parts of the Province it is difficult to find a supply of water for proposed and active water flood schemes. In this regard, the Geology Department assists in the enforcement of groundwater protection policies to safeguard domestic requirements. These problems are expected to continue in the future and may well involve some fairly sophisticated studies.

Miscellaneous activities included classifying wells, determining casing requirements, collecting stabilized

levels at water supply wells, investigating near-surface blowouts in areas where test hole applications were received, appraising logging and coring programs and providing assistance in the processing of abandonment applications.

In the study of regional projects, good progress was made in evaluating and mapping the Cold Lake oil sands, however, it is unlikely that this work will be completed before mid 1972. An oil sands deposit in the Wabiskaw sand to the East of the Marten Hills Field was also evaluated for the first time. The ground work on orders for designating oil sands deposits has been completed and it is likely that the Board will issue such oil sands Orders in 1972.

The Board's computer facilities were used fairly extensively in data retrieval, reservoir mapping and processing data. A few log evaluations were done through the time-share computer terminal using the Logan program. An attempt was made to use the computer to update a paleozoic sub-surface map, but due to difficulties encountered in program limitations and plotting well locations to match existing maps, the project was not a success.

Geological work for the Department of Mines and Minerals consisted of evaluating parcels for Crown Reserve sales, processing Petroleum and Natural Gas reservation

reports for lease rental credit, preparing zone designations and providing technical advice on applications for gas leases.

(b) Core Storage Center

Working groups from both Norway and the U.S.S.R. visited and studied the Board's Core Storage Center in 1971.

Public use of the examination facilities was somewhat lower than the previous year with an average of about 24 patrons each day. A total of 76,000 boxes of core and some 636,000 samples were examined.

Approximately 315,000 sets of drill cuttings were processed into storage, and some 98,000 boxes of new core were received for storage.

Consistent with the Board's new responsibilities, approximately 1,600 boxes of core from selected coal test holes were accepted into storage at the Center.

(c) Drafting Section

A substantial amount of time was spent on updating over 150 well location maps. To improve the efficiency of this operation the Drafting Section in co-operation with the Data Processing Department developed a system of updating such maps using the Board's computer which resulted in a significant reduction of manual hours.

Other activities of more or less a normal nature included the revision of maps depicting Base of the Fish Scale contours; monthly revision of Board Order plats; preparation of transparencies for overhead and 35 MM projectors for use by senior Board personnel and the preparation of gas reservoir performance chart masters.

E HYDRO AND ELECTRIC DEPARTMENT

Responsibilities and Functions

During 1971, the Department carried out its duties in support of the Board's responsibility to provide efficient and economic development in the public interest of the electric industry in Alberta, under the provisions of the Hydro and Electric Energy Act and a series of Interim Directives. The Interim Directives used during the Department's formative stage will be replaced by regulations under the Act as soon as it is possible to develop regulations in a workable form suited to the electric industry of the Province.

For efficiency of operation, the industry is divided into a number of regulated monopolies, each operating within a relatively exclusive geographic area, and each being either municipally owned or investor owned. The industry is almost completely interconnected electrically and the Department provides regulations, reviews

long-range planning, and reviews applications for Board approval of additions to the individual systems, as though the Provincial system is one integrated operation.

Specifically, the major duties of the Department are

1. to provide for the recording and timely and useful dissemination of information regarding hydro energy and the generation, transmission, and distribution of electric energy in Alberta, and the transmission of electric energy from or to Alberta;
2. to provide records and background material which will allow the examination of applications for additions to individual systems to be performed with a view to the whole Provincial system;
3. to assess the technical, economic, and environmental merits of alternative additions to the Provincial system, proposed to the Board either in connection with the long range planning or as formal applications for approval and operation of new facilities in consultation with other appropriate Government Departments;

4. to maintain a watching brief on behalf of the Board to ensure that operations in the hydro and electric energy field are proceeding with the observance of safe practices in the public interest and with due concern for the environment; and
5. to provide the professional technical capability to communicate effectively with the electric industry and evaluate the industry in Alberta in comparison with the state of the art and in comparison with other Canadian and North American electric systems.

Organization and Staff

The Department consisted only of the Manager from September until early December when a Technician, then a Senior Engineer and a stenographer were added to the staff. The Department is primarily of a technical nature and is still evolving and adjusting to its responsibilities under the Hydro and Electric Energy Act.

Activities During the Year

During 1971, the Department assisted in the preparation of the Board's decision report on the application by Canadian Utilities, Limited for approval of a 150 megawatt addition to the Battle River thermal plant.

It also made preliminary studies of the applications by Calgary Power, Ltd. and Edmonton Power for approval of additions to their respective thermal plants at the Sundance and Clover Bar sites. The rather lengthy process of examining and defining service areas of the various operators of electric distribution systems commenced. Discussions were initiated with the industry in connection with the provision of monthly and yearly statistics. The first applications under The Hydro and Electric Energy Act for the construction and operation of transmission lines, distribution systems, and for a small isolated power plant were processed. A considerable amount of the time involved in processing the first applications was spent in determining procedures so that future applications could be processed in a more efficient manner.

The Department also provided material for this and other Board reports and co-operated with the Economics Department in obtaining electric industry information. This was carried out on an "as required" basis because the more formal and regular reporting system for the industry had not been implemented in 1971. Material from the former Alberta Power Commission files was examined and discussions were held with various Alberta Government agencies, Departments, and the Provincial electric industry to obtain the data needed to provide continuity and to update the former regulatory methods to those under the new Act.

F COAL DEPARTMENT

Responsibilities and Functions

The Coal Department of the Board was established on August 1, 1971 in order to prepare for the assumption of the responsibility for the administration of The Coal Mines Regulation Act and The Quarries Regulation Act. Such responsibility was assigned to the Board by proclamation of section 52 of The Energy Resources Conservation Act to come into effect on January 1, 1972.

In the administration of these Acts the Coal Department is concerned with ensuring the safety of workmen in coal mines and quarries and to some extent with the conservation of coal resources. In accordance with these objectives, the Department inspects coal mines and quarries with respect to safety and conservation, issues permits for coal mining and quarrying operations, and approves abandonment operations for coal mines and quarries.

Under the proposed new Coal Conservation Act, the Department will process, and advise the Board regarding the disposition of applications for permits to explore or develop mine sites, licences to operate coal mines, approvals of operations and abandonment of coal processing plants, and approvals of mine site abandonment. It

will also assume responsibility related to the control of the impact on the environment of the exploration for coal, and the operation and abandonment of coal mines and coal processing plants. Accordingly, mine site inspections will include pollution-related aspects.

Organization and Staff

To year-end, the Department consisted of only the Manager and his stenographer. (As of February 1, 1972, technical staff consisted of two Engineers, a Geologist and inspection staff. The inspection staff headed by the Director of Mines and consisting of four district mine inspectors and one mine electrical inspector was transferred with the administration of other Acts from the Department of Mines and Minerals.)

Activities During the Year

During the latter part of 1971, the Coal Department assisted in drafting the proposed new Coal Conservation Act which will provide legislation for the non-safety aspects of the coal mining industry. This draft Bill was submitted to the Government for consideration of the Legislature at its 1972 spring sitting.

Pending enactment of the proposed Coal Conservation Act, the Department prepared a series of interim directives governing the submission of coal production and disposition

statistics, samples and analytical data, and applications for permits, licences and approvals.

Preliminary steps were taken to establish the mechanics necessary for a continuing program of coal reserves appraisal, and a tentative designation of coal fields in the Province was prepared.

The Department also assisted in the Board's co-ordinating role in the establishment of training programs for coal mining and processing technicians.

G DATA PROCESSING DEPARTMENT

Responsibilities and Functions

The Data Processing Department is responsible for carrying out systems planning, program development, computer operations, staff training related to data processing, and for reviewing data processing advances and new equipment development.

More specifically, the responsibilities of the Department are

1. to analyze existing and proposed manual and computer systems with a view to designing and implementing new systems, improvements and innovations;
2. to write engineering, accounting, statistical and economics related computer programs as required in the work of the Board organization;

3. to accurately process data received from other departments and industry in order to obtain statistics for internal use or for publication;
4. to perform computer calculations for geological and for oil and gas engineering evaluations;
5. to carry out effective closed shop programming by educating Department staff and by maintaining an appropriate literature and program library;
6. to encourage open shop programming by educating staff from other departments and by assisting with open shop programming assignments where necessary;
7. to advise the Board on advances in the field of computer technology; and
8. to familiarize supervisors and personnel throughout the organization with computer applications, data processing and effective systems planning.

Organization and Staff

The Data Processing Department is divided under the Manager into three Sections. In addition to assisting the Manager in the administration of the Department, the Assistant Manager assumes specific responsibility for the Programming Section. The Systems Supervisor and the Supervisor of Operations assume the direction of

their respective Sections and report directly to the Manager. The remainder of the staff comprises one Systems Analyst, seven Programmer Analysts, eight Computer or Key punch Operators and a Stenographer.

The Programming Section is responsible for all computer systems and programs required by other departments in the Board organization, while the Operations Section is responsible for all functions related to machine processing. The Systems Section works closely with other departments and with the Programming Section in the development of new manual and computer systems.

Activities During the Year

One of the major activities of the Department during 1971 involved the detailed design of an Integrated Data Base to be resident on random access devices. As the first phase in the development of the overall system, a complete redesign of the existing production and injection files was undertaken, along with the associated programming for file conversion, maintenance and generation of output reports. By the end of the year most of the programs in the system were tested and file conversion verified. The first phase should be fully implemented and operational by January, 1972. Subsequent phases will involve the integration of the battery approval, disposition and allowables surveillance

systems. Ultimate development may include the General Well Data File and the Core Analysis File systems, as well.

Several other significant new systems were designed and implemented during the year. These were

- (i) a computerized system of generating gas pool performance charts through the facilities of "Computer Output Microfilm" equipment and digital plotters;
- (ii) a computerized system for the generation of the annual Schedule of Wells publication by utilizing the Board's General Well Data File, and
- (iii) a computer assisted system of lease inspection scheduling, reporting and surveillance.

In addition to these major activities, the Programming Section continued to modify and expand its library of technical and business computer programs and to provide assistance in the use of these programs to user staff.

During the year, both the Systems and Programming Sections were involved in the detailed design of three major computerized file systems. These were

- (i) the Field-Pool Summary Data;
- (ii) the Reserves and Market Demand System; and
- (iii) the Gas Gathering and Gas Plant Statistics System.

These systems are scheduled for implementation during 1972.

Within the Systems Section itself, a re-organization took place through the creation of an 'Inter-Department Systems Staff', consisting of the present Data Processing systems staff and a selected group of systems analysts from other departments. The function of this 'combination systems staff' is to conduct systems planning and design on inter-departmental matters and within the respective departments of the Board under the guidance of the Systems Supervisor.

One of the major studies conducted by the Systems Section dealt with the problem of data duplication and storage of well data within the Board organization. The results of this study lead to the design of a full scale microfilm system of well data storage, a portion of which was implemented by the end of the year. Other areas that the Systems Section studied involved the operation of the Board's Chemical Laboratory, and the indexing and computer assisted maintenance of the various Board Acts and Regulations.

During the year the Operations' Section was concerned primarily with the routine encoding and processing of business and technical data for the organization. As well, the Section continued to improve schedules and machine room efficiency through the increased use of multi-program-

ming techniques and through the installation of new hardware equipment. Installations included a higher speed printer and larger disk facilities.

Total monthly computer equipment rentals at year end were slightly less than at the start of the year. Two shifts per day, very often supplemented by extended shifts, were required to maintain the Board's work load.

H ECONOMICS DEPARTMENT

Responsibilities and Functions

The Economics Department is responsible for economic analysis and evaluation, the compilation of statistics and forecasts and the preparation of the monthly proration order.

The main functions of the Economics Department are

1. in co-operation with the Oil and Gas Departments, to forecast demand and supply for liquid hydrocarbons, natural gas and sulphur in the Province of Alberta;
2. to prepare a five-year forecast of petroleum industry activity relative to the functions of the Board to serve as a basis for the Board's annual five-year expenditure and revenue forecast;
3. to carry out special studies relating to economic aspects of conservation and applications presented to the Board;

4. in co-operation with the Oil Department, to carry out the monthly oil proration computation;
5. to assess the competitive position of Alberta crude oil in existing and potential market areas; and
6. to compile statistical and other information covering all aspects of the oil and gas industry and, beginning during 1971, on the coal and hydro and electric industries.

Organization and Staff

The staff complement at December 31, 1971, comprised the Department Manager, three Economists, an Economics Assistant, three Clerks and a Senior Typist.

Activities During the Year

A major portion of the Department's work in 1971 related to a comprehensive forecast of the demand for Alberta oil to 1980. Factors affecting the future demand for Alberta oil which were examined included the anticipated development of Canadian and United States demand for energy and subsequently for petroleum products, developments in established and new Canadian crude oil producing regions outside Alberta, and developments in United States production. The forecast of Alberta oil production incorporated projections of pentanes plus production prepared by the Gas Department and projections of conventional crude oil reserve growth supplied by

the Oil Department. In addition, the forecast included consideration of the development of the Athabasca oil sands. The major conclusions of the forecast were published in the Board's report concerning an application by the Syncrude group to amend their 1969 authorization to recover oil from the Athabasca oil sands.

Early in 1971 the Department completed studies for the Board report respecting the Province's future gas requirements. The Board's findings were utilized by the Department in projects related to applications by Alberta and Southern Gas Co. Ltd., Consolidated Natural Gas Limited and Trans-Canada Pipe Lines Limited for amended permits authorizing the removal of gas from the Province.

In addition to the natural gas applications, the Department assisted in the assessment of applications to permit the removal of propane and ethane from the Province. The applications considered were those by Dome Petroleum Limited and Amoco Canada Petroleum Company Ltd. and Dome Petroleum Limited and TransCanada GasProducts Ltd. to remove an additional 53.2 million barrels and 20.6 million barrels of propane, respectively, and by Dome Petroleum Limited and Amoco Canada Petroleum Company Ltd. for a permit authorizing the removal of some 253 million barrels of ethane from the Province. Consideration of the latter application required that the Department prepare, for the first time, a forecast of Alberta's long term ethane requirements.

Aside from work related to applications requesting the removal of gas, propane and ethane volumes from the Province, the Department was involved in the appraisal of an application by Canadian Utilites, Limited for construction of an additional 150 megawatt generating station on the Battle River near Forestburg. Towards the end of the year, the Department undertook work related to an application by the Independent Petroleum Association of Canada for modifications to the current oil proration plan.

A major activity of the Department during 1971 concerned the preparation and implementation of a master plan to ensure that the production of conventional crude oil forthcoming from the monthly Market Demand Order is aligned more closely to purchasers' requirements for oil. The plan was developed following discussions with industry and went into full operation in December 1971. Details of the plan were outlined by the Board in Informational Letter No. IL 71-27.

The Department prepared a survey of Alberta pentanes plus (including condensate) productive capacity and in early 1971, in response to a possible oversupply of pentanes plus production, assisted in the preparation of a plan to deal with the immediate surplus and with a longer term surplus should it develop. Work on this matter did not continue as the Board received assurances

from each of the major producers and purchasers of pentanes plus that they would resolve any oversupply situations occurring through to mid 1972.

The Department also undertook work on its procedures for processing applications for the removal of gas from the Province and updating and reviewing requirements forecasts during 1971. In addition, the Department assisted with work related to the Annual Reserves Report and maintained a continuing assessment of Alberta crude oil productive capacity and major pipe line capacity. The Department continued to assess, on a regular basis, the effectiveness of Canada's National Oil Policy. As well, procedures were initiated with regard to collecting and compiling energy statistics related to electricity and coal and to analysing, on a continuing basis, world tanker rates for oil. An assessment of the influence of import tickets on the United States demand for Canadian oil was also undertaken. Members of the Department served on committees concerned with the publication of Board statistics and the analysis of reserve growth trends.

I ACCOUNTING DEPARTMENT

(a) Financial Accounting Section

Responsibilities and Functions

The Financial Accounting Section is responsible for all general accounting and budget preparation. It assists

in the collection of the Board's annual tax levy and provides the Board with all information for budget control.

The major functions of the Section are

1. to process all expenditures, receive all revenues and maintain all necessary records;
2. to close the accounting records as at March 31 each year and co-operate with a representative from the Provincial Auditor in his annual audit;
3. to prepare, in co-operation with the other departments, the budget for Board approval for the next fiscal year and prepare a five-year forecast of expenditure and revenue;
4. to provide the Board with monthly statements comparing budgeted and actual expenditure and revenue, to assist in the maintenance of control over expenditure, and to make recommendations regarding financial policies;
5. to assist, in co-operation with the Assistant Assessor, in the collection and follow-up of outstanding tax accounts; and
6. to maintain records necessary to the control of all inventorial assets of the Board and to supervise the annual physical check of inventory items.

Organization and Staff

The Financial Accountant is the head of the Section and is responsible to the Manager of the Accounting Department. The staff complement at December 31, 1971, consisted of the Financial Accountant, three Accounting Clerks, one Typist and a Book-keeping Machine Operator.

Activities During the Year

During 1971, the general accounting functions embracing revenues, expenditures and budget were routine, and a comparison of the last five years are shown in two tables on pages 99 and 100.

(b) Production Accounting Section

Responsibilities and Functions

The Production Accounting Section is responsible for the receipt and processing of oil and gas production and disposition reports, and the preparation of detailed and summary information for use by the Board, industry, other agencies and the general public. The assessment functions are also performed by the Production Accounting Section.

The major functions of the Section are

1. to collect from industry the well production data and well and plant disposition data required under the Act;

2. to ensure that the reporting forms in use provide for the collection of required information and are revised to meet changing needs;
3. to co-operate with other Provincial and Federal agencies in the use of comparable forms, and in the avoidance of duplicate collections of original data, where possible;
4. to examine the reports received to ensure that regulatory requirements are met by the operators and, with the assistance of the Data Processing Department, to prepare detailed and summary records;
5. to check the reported oil, gas and water production against assigned allowables and notify operators of the over or under production status for each of their wells;
6. to ensure that the monthly and annual statistical reports and well and pool production publications are kept up to date and processed on schedule; and
7. to prepare the assessment roll, to issue assessment notices, process appeals, issue tax notices and assist in the collection of the tax levy.

Organization and Staff

The Production Accountant, who is also the Board's Assessor, is the head of the Section and is responsible to the Manager of the Accounting Department. The staff complement at December 31, 1971 consisted of 4 Supervisors, 19 Clerks and a Stenographer.

Activities During the Year

During 1971 considerable emphasis in the Production Accounting Section was placed on consolidating the improvements which had been made in 1970. At the same time, a number of changes in routine and policy were implemented.

In the processing of reports the work of the surveillance group which had been formed in 1970 to liaise directly with industry regarding reporting and processing errors continued to yield good results.

Effective May 1, 1971, the method of determining over and under production for wells on "Maximum Rate Limitation" was changed to permit a six month reconciliation in place of the more restrictive method formerly used. This has been well received by industry.

The statistics and publications staff conducted a lengthy study into means of improving the utility of the Board's publications and major changes have been approved for implementation commencing January, 1972. The scope of this work will be broadened in 1972 by the

gathering and publication of statistics on coal and electric energy. Much preliminary work towards this end has already been completed.

General improvement in published statistics of plant products has been noted due in part to continued close liaison with industry committees. During the year, important revisions were made to the reporting statements for gas gathering systems, gas processing plants, and gas plant products. These have resulted in more satisfactory statistics in this important area.

The Water Disposal System reporting form and the Water Injection System reporting form were combined into one form and will become effective commencing January 1, 1972. At the same time, the Board will require reporting of production from individual water supply wells which are used for enhanced recovery purposes.

The Systems staff of the Department assisted the Data Processing Department in the development of an Integrated Data Base.

J OFFICE SERVICES DEPARTMENT

Responsibilities and Functions

The Department is responsible for purchasing, printing, mailing, control of well records and central filing, building requirements and services, and switchboard and reception duties.

The major functions are

1. to attend to space, service and insurance requirements of all buildings occupied by the Board;
2. to maintain a purchasing and stock control program;
3. surveillance and control of motor vehicle operating costs;
4. to print or arrange for commercial printing of letters, order forms, reports, publications, maps, amendments to Acts, Regulations and the Index of Board Orders and maintain address plates for various appropriate lists;
5. to attend to all mailing functions and to operate the main file system, to serve public requests for information from filed documents and to provide transcriptions of public hearings; and
6. to maintain drilling and completion records for all wells drilled.

Organization and Staff

The Department is headed by the Manager, who reports to the Board. There are three Sections in the Department; Printing, Records and Purchasing, each headed by a Supervisor. The staff complement includes 30 Clerks, 6 Machine Operators, 3 Receptionists, 1 Switchboard Operator, 1 Stenographer, and 1 Typist.

Activities During the Year

During 1971, in addition to normal routines, a number of additional tasks concerning the change to "Energy Resources" from "Oil and Gas" were handled. These included

- (i) conversion of all forms, letterheads, and the like;
- (ii) space planning for occupancy of a fourth floor; and
- (iii) extensions to the Edmonton and Red Deer area offices.

A major improvement in communications was the installation of a modern telephone switchboard.

A system for microfilming well files, which is expected to significantly improve efficiency in regard to use and space requirements was approved by the Board. Microfilming the files started late in 1971.

K PERSONNEL DEPARTMENT

Responsibilities and Functions

The Personnel Department is primarily responsible for attracting competent staff to the organization, and for ensuring that the Board's personnel policies, benefits, and salaries are equitably administered. The principal continuing functions are

1. to recruit new staff in co-operation with individual departments;
2. to apply the Board's salary administration policy, and to conduct regular salary surveys to ensure salaries are competitive;
3. to administer programs of employee performance evaluation, performance discussion, continuing education, and employee fringe benefits;
4. to retain an historical and up to date personnel file on each employee;
5. to orient new staff to the overall Board organization and to other departments;
6. to counsel individual employees in vocational, benefits, personal, supervisory, and safety subjects; and
7. to ensure the Board's Personnel Administration policies are current and that they are administered consistently.

Organization and Staff

The Department is directed by the Manager, who reports directly to the Board. He is assisted by two Personnel Assistants, one Clerk and one Stenographer.

Activities During the Year

The Department completed its extensive survey of salaries being paid by the local petroleum industry,

supplemented by data obtained from the Provincial and Federal Governments. The analysis of the material was computer assisted to a greater extent than in any previous year. As a result of the computer assistance, the salary administration policy for supervisory, non-professional employees was changed in 1971 to be similar to that already existing for professional staff. As a result, all supervisory and professional staff salaries are now administered along maturity curves, which gives greater emphasis for salary purposes to an employee's actual performance on the job.

A major review of the Board's employee benefits was commenced in 1971 and, as a result, a study of possible changes is being undertaken.

In addition to continuing the regular presentation of a Basic English Course and a Rapid Reading Course, the Department prepared and presented a Salary Administration Course to supervisory personnel, and a Performance Discussion Course was presented to all interested personnel.

The Department continued to emphasize its role of employee counsellor. In 1971 more employees than in any previous year sought advice from the Department on subjects ranging from vocational careers to personal problems. The employee relations aspect of the Department's operation will continue to receive major attention.

VIII EXPENDITURE AND REVENUE

The Board's official fiscal year end is March 31, but, since all other sections of this report relate to the calendar year the Board has decided to treat the expected expenditures and revenues relating to the fiscal year April 1, 1971 to March 31, 1972, as applying to the 1971 calendar year. Financial data for previous fiscal years are applied to the calendar year in a similar manner.

The year 1971 was a transition one in which the Board started its work related to hydro and electric energy, coal and pipe lines. Expenditures in connection with these new activities were \$104,000, \$112,000 and \$77,000 respectively. These were met entirely from funds provided by the Provincial Government. Net expenditures for the Board's oil and gas related operations were \$3,572,000. These were met to the extent of fifty per cent from the revenues of the tax levied by the Board upon oil and gas property in the Province and fifty per cent from an appropriation from the Provincial Government. The oil and gas expenditures are directly comparable with those of recent years except that in 1970 and 1971 the Board assumed greater responsibilities related to pollution control which resulted in abnormal increases in expenditures for this purpose.

The accompanying table provides a summary and comparison of oil and gas expenditures and revenues of the Board for the years 1967 to 1971 inclusive. The Board's net expenditure represents the sum of salary, general operating, and capital expenditures less collections from the sale of publications and information. The cost of capital acquisition is charged in full against revenue in the year of purchase.

The Board's total oil and gas expenditure increased by some 10.3 per cent between 1971 and 1970 reflecting increased salary and other costs and increased pollution control activity and resultant costs. Net expenditure during 1971 was \$3,572,000, an increase of \$560,000 or 18.6 per cent over the previous year. The large increase in net expenditure in 1971 is accounted for by abnormally high non-recurring collections in 1970.

Collections decreased from \$510,000 to \$315,000, due mainly to the fact that during 1970 extraordinary income was received from the sale of the Board's historical well data file and the core analysis file on magnetic tape.

The second accompanying table gives a comparison of Board oil and gas net expenditures in terms of wells capable of production and equivalent barrels of production*. Industry production revenue represents the total sales value of crude

* Equivalent barrels - total value of industry production divided by the weighted average price per barrel of crude oil.

oil, natural gas and products at the well or plant. In 1971 the value of crude oil sales represented some 76 per cent of the total production revenue, unchanged from 1970.

The cost of operating the Board in terms of a capable well increased from \$153 in 1970 to \$177 in 1971. A review of these costs over a longer period indicate that Board expenditure per capable well increased steadily until 1957, when it reached \$136, and then declined in 1965 to \$115. Increases in salary costs, and the reduced rate of increase in the number of capable wells, due largely to the lack of any major discoveries and to the introduction of the new proration plan in May, 1965, have reversed that trend. Board net expenditures per equivalent barrel of production decreased from 0.69 cents to 0.60 cents over the period 1966 to 1970 and increased in 1971 to 0.65 cents.

For 1971, the Provincial Government provided some \$1,786,000 by appropriation to cover fifty per cent of the Board's net oil and gas expenditures. An equivalent amount was provided by a tax levy charged to all owners, other than the Government, of oil and gas properties.

The assessed value of oil and gas properties subject to assessment in 1971 was \$2,839,000,000 which resulted in a mill rate of 0.64, as compared to 0.68 in 1970, to provide the portion of Board revenue required by taxation.

ENERGY RESOURCES CONSERVATION BOARD
COMPARATIVE STATEMENT OF
OIL AND GAS RELATED EXPENDITURE AND REVENUE
FOR THE FIVE YEARS 1967 - 1971
(000's Dollars)

OIL AND GAS CONSERVATION ACT

	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>
<u>Expenditure</u>					
Salaries	\$1,953	\$2,090	\$2,268	\$2,593	\$2,870
General Operating					
Building rent, utilities	193	217	218	217	232
Machine rental & repairs	119	125	142	214	198
Printing, office supplies	88	84	96	93	97
Travelling, automobiles	64	68	76	102	122
Telephone	27	30	32	38	56
Lab. and field supplies	22	20	32	37	41
Miscellaneous	<u>75</u>	<u>86</u>	<u>100</u>	<u>110</u>	<u>136</u>
	588	630	696	811	882
Capital	<u>51</u>	<u>63</u>	<u>91</u>	<u>118</u>	<u>135</u>
Total	\$2,592	\$2,783	\$3,055	\$3,522	\$3,887
<u>Collections</u>	<u>234</u>	<u>297</u>	<u>381</u>	<u>510</u>	<u>315</u>
<u>Net Expenditure</u>	<u>\$2,358</u>	<u>\$2,486</u>	<u>\$2,674</u>	<u>\$3,012</u>	<u>\$3,572</u>

Revenue

Tax Levy	\$1,237	\$1,301	\$1,424	\$1,506	\$1,786
Province of Alberta	<u>1,121</u>	<u>1,185</u>	<u>1,250</u>	<u>1,506</u>	<u>1,786</u>
Total	<u>\$2,358</u>	<u>\$2,486</u>	<u>\$2,674</u>	<u>\$3,012</u>	<u>\$3,572</u>

Per Cent Increase in
Total Expenditure Over
Previous Year

--- 7.4 9.4 14.4 10.3

Per Cent Increase In
Net Expenditure Over
Previous Year

11.1 5.4 7.6 12.4 18.6

ENERGY RESOURCES CONSERVATION BOARD

COMPARISON OF NET EXPENDITURE OF BOARD

FOR OIL AND GAS OPERATIONS

Total Capable Wells	Value of Industry Production Dollars (000)	Industry Production Equivalent Barrels*(000)	Board Net Oil & Gas Expenditures Dollars (000)	Board Staff Complement at December 31	Capable Wells per Board Staff Member	Board Net Oil and Gas Expenditure	
						Per Capable Well (Dollars)	Per Equivalent Barrel (Cents)
17,586	912,443	361,191	2,358.	265	66	134	0.66
18,312	1,054,776	409,905	2,486	271	68	136	0.61
19,033	1,129,188	441,089	2,674	275	69	140	0.61
19,598	1,303,975	501,528	3,012	299	66	153	0.60
20,250	1,487,400	555,000	3,572	312	65	177	0.65

*Equivalent Barrels = $\frac{\text{Total value of industry production}}{\text{Weighted average price per barrel of crude oil}}$

IX PUBLICATIONS AND ADDRESSES

The Board makes available to industry and the general public a wide variety of publications and maps. The pricing policy is based on the principle that those costs associated with a publication which are over and above normal operating costs must be met by revenue generated from its sale.

In 1971 the following special reports resulted from major public hearings:

- | | |
|--------------|---|
| OGCB 71-A | In the Matter of an Application of Alberta and Southern Gas Co. Ltd. and In the Matter of an Application of Consolidated Natural Gas Limited Both Under the Gas Resources Preservation Act, 1956 |
| OGCB 71-B | Report and Decision Regarding Alberta's Future Requirements for Gas |
| ERCB 71-C-HE | In the Matter of an Application of Canadian Utilities, Limited for Approval of the Construction and Operation of an Addition to the Battle River Power Plant, and for an Order for its Interconnection |
| ERCB 71-D-OG | In the Matter of an Application of Trans-Canada Pipe Lines Limited Under the Gas Resources Preservation Act |
| ERCB 71-E-OG | In the Matter of an Application for a Permit Authorizing the Removal of Ethane from the Province of Dome Petroleum Limited and Amoco Canada Petroleum Company Ltd. under The Gas Resources Preservation Act |
| ERCB 71-F-OG | In the Matter of an Application of Atlantic Richfield Canada Ltd., Canada-Cities Service, Ltd., Gulf Oil Canada Limited and Imperial Oil Limited Under Part 8 of the Oil and Gas Conservation Act |

Addresses and Technical Papers

The following addresses, lectures or technical papers were presented by members of the Board and its staff in 1971. An asterisk indicates that a copy of the address can be provided.

<u>SPEAKER</u>	<u>TITLE OF ADDRESS</u>
G. W. Govier	*"The Proposed Energy Resources Conservation Board and its Role with the Coal Industry" Coal Operators Association of Western Canada April 2, 1971
G. W. Govier	"Recent Changes Affecting the Administration of Alberta's Energy Resources" The Petroleum Society of C.I.M., Calgary Section August 18, 1971
G. W. Govier	"Energy Resources Conservation Board Responsibilities" The Association of Professional Engineers, Geologists and Geophysicists of Alberta October 13, 1971
G. W. Govier	"Administration of Alberta's Energy Resources" Russian Delegation October 14, 1971
D. R. Craig J. A. Bray (co-author)	"Gas Injection and Miscible Flooding" World Petroleum Congress Moscow June, 1971
D. R. Craig	"The Consulting Engineer in Alberta's Oil and Gas Development" Association of Consulting Engineers of Canada and the Consulting Practice Committee of the Association of Professional Engineers, Geologists and Geophysicists of Alberta October 21, 1971

D. R. Craig	"Advances in Pollution Control in Alberta Sour Gas Processing Plants" Air Pollution Control Association Pacific Northwest International Section November 22, 1971
V. Millard	*"Forecast of Productivity of Alberta Crude Oil" Nesbitt, Thomson Oil Seminar for Investment Analysts from Eastern Canada and U.S.A. May 26, 1971
V. Millard	*"The Administration of Alberta's Proration System" Inter-provincial Pipe Line Co. Meeting of Crude Oil Purchasers June 23, 1971
V. E. Bohme	"Environment Control in the Oil and Gas Drilling and Producing Industry" Alberta Risk & Insurance Manage- ment Society January 7, 1971
V. E. Bohme	"Use of Fresh Water in Oil Field Pressure Maintenance" Alberta Fish & Game Society, Edmonton April 25, 1971
V. E. Bohme G. J. DeSorcy	*"Pollution Control in Alberta's Oil and Gas Industry" Society of Petroleum Engineers of AIME Los Angeles November 5, 1971
L. A. Bellows	"Pollution Control in the Oil and Gas Industry" Canadian Association of Petroleum Production Accounting September 7, 1971
L. A. Bellows	"Environmental Control" Calgary Desk and Derrick October 19, 1971

<u>SPEAKER</u>	<u>TITLE OF ADDRESS</u>
D. Larbalestier	"Board's Role in Pollution Control" Windsor Park School January 12, 1971
D. Larbalestier	Board's Regulations Applying to Drilling Series of Accident Prevention Seminars Alberta Petroleum Training Service June 2, 1971
M. Gibson V. Jones	"Board's Cementing Requirements" Sales Staff - Dresser Industries Incorporated February 1, 1971
R. Gossel	"Environmental Control at Gas Plants" Two classes of Gas Technology Course at NAIT, Edmonton May 19, 1971
M. Koziol	"Conservation of Oil & Gas Resources" Central Elementary School, Red Deer November 4, 1971
M. Koziol	"Purpose and Function of Energy Resources Conservation Board" Red Deer College, Geography Course (night class) November 24, 1971
M. Koziol	"Role of Provincial Government (ERCB) in Regard to Pollution Control in the Oil & Gas Industry" Red Deer College, Business Administration December 3, 1971
R. Villeneuve	"The Control of Air Pollution with Respect to the Oil and Gas Conservation Regulations" PITS Course - Handling of Natural Gas November 5, 1971
G. J. DeSorcy	"Exemption from Municipal Taxation for Pollution Control Equipment" Alberta Assessors Association Conference Red Deer April 15, 1971

SPEAKER

TITLE OF ADDRESS

R. B. Dunbar	"Air Pollution" Petroleum Industry Training Service Gas Technology Course - Banff February 17, 1971
R. B. Dunbar	"Career Opportunities for Engineers in the Petroleum Producing Industry - Gas Processing" University of Manitoba Engineering class Sponsored by S.E.I.C. and Petroleum Society of C.I.M. November 18, 1971
J. A. Bray	"Gas Injection and Miscible Flooding" Petroleum Society of C.I.M. October, 1971
R. G. Evans	"Alberta Oil Proration System" PITS Unitization, Banff School of Fine Arts November 15 & 19, 1971
M. J. Stowko	"Production Spacing Units, Blocks and Projects" SAIT Petroleum Technology Students May, 1971

AUTHOR

TITLE OF TECHNICAL PAPER

G. J. DeSorcy	"What New Regulations Mean to Operators" Canadian Gas Journal March/April, 1971
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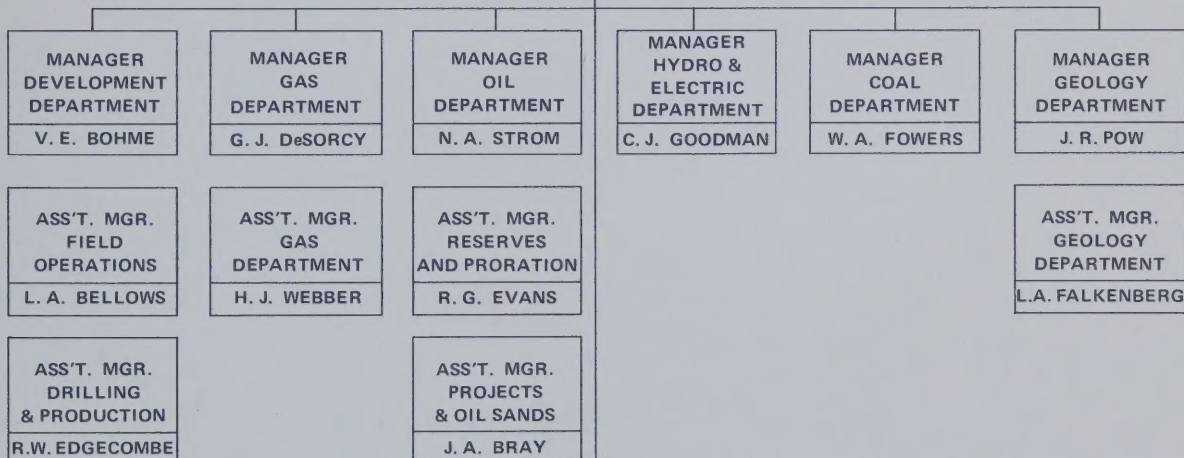
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